

RECOMMENDATIONS FOR THE TREATMENT OF PEDICULOSIS CAPITIS (HEAD LICE) IN CHILDREN

I. INTRODUCTION:

A. Definition:

The diagnosis of head lice or pediculosis is made when there is an active infestation of the hair and scalp by the parasitic insect *Pediculus humanus capitis*. The condition is contagious as the insect is spread by direct head to head contact and less commonly by fomite transmission via brushes, hats, and pillowcases, etc. The insect feeds on the host's blood by biting the scalp and the common symptom of scalp pruritis is caused by an immune response to the insect's saliva. Though of no danger to the host, head lice can cause considerable discomfort and present the possibility of cutaneous infection secondary to itching. [1]

B. Incidence and Prevalence:

Head lice are found in all human populations, with a higher prevalence in developing countries. In the United States, there is a higher prevalence in children than adults, having peak prevalence at 4-11 years, though this distribution is less apparent in developing countries. There is a higher incidence of infestation in long and medium length hair as compared to short hair and the male to female incidence ratio is 1:2 [2]. There is a decreased prevalence in ethnic groups with coarse hair, as African Americans. [3] There is no causal relationship between hygiene practices, socioeconomic status, level of education or nutritional status and pediculosis.

II. PATHOGENESIS:

A. Natural History of Pediculus humanus var. capitis, human head lice:

1. Eternal parasites of humans with obligatory blood-feeding habits
2. Saliva is vasodilator, may have anticoagulant properties
3. Must eat blood meal every 4–6 hours
4. Off the scalp, viable for no more than 2 – 3 days [4]
5. Lifecycle:
 - a. Stage 1: The egg
 - Attached to hair shaft by gel secreted by the female louse
 - Lies 1–3 mm from the scalp
 - Must have warmth of scalp to hatch
 - Embryonic egg is small, translucent, hard to see
 - After 6-10 days, the fertilized eggs hatch
 - Once hatched, the empty shell, a nit, is easier to see
 - Eggs are not infectious [5]
 - b. Stage 2 the nymph
 - Smaller than an adult, hard to see
 - Not able to reproduce

- Molts 3 times, matures in 9-15 days [5]
- Not easily transmitted to others
- First and second instar nymphs are not transmitted to others [5]
- Only third instar nymphs are capable of transmission to others [5]
- c. Stage 3: The adult
 - Size of sesame seed, brownish red
 - Moves quickly but does not hop or fly [1]
 - Mate as soon as mature, lays eggs 1-2 days later
 - Lives 30 days producing more than 100 eggs at up to 6 eggs per day
 - Takes at least 30 seconds to transmit from head to head [5]
- 6. Spiracles (holes in body serving as breathing apparatus) close when in water; can be dormant for as long as 4 hours in that state
- B. Transmission and infestation in humans:
 1. Almost exclusively transmitted by prolonged head-to-head contact [5]
 2. Usually found on scalp but can occur in eyebrows
 3. Transmission increased in crowded living conditions
 4. May be transmitted by frequent hugging
 5. Sharing comb/brushes/hats may or may not transmit lice [1]
 6. Lice are not responsible for spread of any disease
 7. There is no evidence that poor personal hygiene causes head lice
 8. Once infection with head lice occurs, it develops steadily if left unchecked
 9. Most cases of head lice infection are symptomless
 10. Pruritus from sensitization to parasites saliva usually lead to detection
 11. Pruritus can take up to 3 months to develop [5]
 12. Scratching can cause secondary bacterial infections (impetigo, pyoderma)
 13. Some infected bites lead to lymphadenopathy
 14. Severe louse infections of 12-18 months can cause general systemic reactions of malaise and generally feeling "lousy" [5]

III. **SUBJECTIVE ASSESSMENT:**

A. History of present illness:

1. Confirmed case of active head louse infestation among family members, classmates or anyone else who is in close personal contact
2. Recent use of comb/brush or hat that belonged to someone with a confirmed case of head lice
3. Recent case of active head louse infestation
4. Visualization of a nit found within a 1/4 inch of the scalp visualization of an adult louse or nymph [6]
5. Generalized Itching of scalp and nape of neck
6. Generalized intense itching of scalp
7. Itching at the nape of the neck
8. Intense itching at night
9. Presence of pruritic papules at nape of neck or around ears

B. Past Medical History

1. Head lice infestation, either treated or untreated

2. History of hypersensitivity reaction to any pediculicides treatment
3. History of seizure disorder
- C. Medication History
 1. Current prescription medications
 2. Over-the-counter medications to include herbal treatments
 3. History of hypersensitivity reaction to any pediculicides treatment
- D. Family History
 1. Any active or recent louse infestation within immediate family [7]
- E. Psychosocial History
 1. Evaluate availability of support systems
 2. Evaluate for history of compliance with medication regimen
 3. Evaluate coping mechanisms related to dealing with social stigmas
- F. Dietary History

Not applicable to this condition

IV. OBJECTIVE ASSESSMENT:

- A. Physical Exam
 1. Examination of the scalp and hair for:
 - a. Nits (ova) within 0.25 inches of scalp [6]
 - b. Crawling lice (adults or nymphs)
 - c. Examine scalp for excoriation infection secondary to scratching
 2. Examination of cervical lymph glands; cervical adenopathy is common with secondary infections
 3. Exam of eyelashes and eyebrows for infestation and prevention of reoccurrence of hair and scalp infestation. Rare but can occur.
- B. Diagnostic Tests
 1. Identification of eggs, nymphs and lice with naked eye or magnifying glass under bright artificial light or direct sunlight
 2. Microscopic exam usually unnecessary.

V. PHARMACOLOGIC THERAPY:

- Best choice will depend on local resistance patterns [5]
 - FDA approved pediculicides (over the counter): Permethrin 1%, Pyrethrins 0.33% synergised with 4% piperonyl butoxide
 - FDA approved pediculicides (prescription only): Lindane 1%, Malathion 0.5%
- A. Pharmacologic options:
 1. Pyrethroid pediculicides: Permethrin and synergized pyrethrin both kill non-resistant crawling lice, but synergized pyrethrin is significantly more ovicidal than permethrin [5]. Treatment failures are common with the pyrethroids due to emergence of resistant strains [8]. Resistant infestations have been treated with prescription-strength permethrins (*Elimite 5%*) normally meant for treating scabies infestations. Higher doses of permethrins generally are not more effective and it is better to consider a different drug. Although permethrin and pyrethrins differ in chemical structure, their mode of action is quite similar. We would anticipate that pyrethrins would also be ineffective in killing permethrin-resistant lice [1]. Permethrin is neurotoxic to lice with low risk to humans due to very low absorption rates, less than 2% absorbed. Consider risk/benefit in pregnancy before using pyrethrin plus piperonyl butoxide,

as danger of absorption is higher than in permethrin. Neither preparation should be left on the scalp for longer than the indicated treatment time of 10 minutes. Contraindications to both pyrethroids include sensitivity to drug, allergy to chrysanthemums or ragweed or acutely inflamed or raw scalp. Side effects to skin; pruritis, erythma, burning, stinging, tingling, numbness, edema and rash. Pyrethroids are eliminated in the urine. Contraindicated in children under 2 months of age; Category B in pregnancy and untested in nursing mothers [9,10].

a. Applications of Shampoo: [6,10]

- Pyrethrin 0.33% synergized with 4% piperonyl butoxide & benzyl alcohol (A-200), and;
- Pyrethrin 0.33% synergized with 4% piperonyl butoxide (*RID*)
 - Use only on children over 2 months of age
 - Shampoo with Prell or other non-cream rinse containing shampoo, rinse hair; towel dry
 - Apply agent thoroughly saturating hair and scalp
 - Do not massage into scalp
 - Leave on for 10 minutes, but no longer, rinse
 - A second treatment must be done 7-10 days after the initial treatment to kill newly hatched lice

b. Applications of Mousse: [10] Pyrethrin 0.33% synergized with 4% piperonyl butoxide (*RID*)

- Apply to dry hair only
- Massage until hair and scalp are thoroughly wet with product
- Leave on hair for 10 minutes, but no longer
- Add sufficient warm water to form a lather and shampoo as usual, rinse thoroughly
- Comb with fine toothed comb to remove dead lice, eggs and nits from hair
- A second treatment must be done 7-10 days after initial treatment to kill any newly hatched lice

c. Applications of Cream Rinse: [3,10]

- Permethrin 1% Cream Rinse (*NIX*)
 - Shampoo with Prell or other non-cream rinse containing shampoo, rinse hair; towel dry
 - Saturate hair and scalp especially behind ears and on nape of neck
 - Leave on hair for 10 minutes, but no longer
 - Rinse with water
 - Comb with fine toothed comb to remove dead lice, eggs and nits from hair
 - A single application is usually sufficient
 - If lice are observed 7 days or more after first application, a second treatment should be given

2. Lindane 1% Shampoo (generic only):

Lindane is the least effective pediculicide and is not ovicidal [8] It is neurotoxic to lice and people and is absorbed slowly through skin, especially face, neck, scalp, scrotum, axillae and damaged skin. It

collects in body fat, is metabolized by the liver and excreted in feces and urine. It is secreted in human milk [9,10] It has low toxicity in humans with indicated application time of 4 minutes [8], Problems with resistance have lead to increased application times in effort to increase efficacy. This results in increased percutaneous absorption and toxic effects on the central nervous system [8]. Contraindicated in children less than 2 years of age, pregnant and nursing mothers and people with known seizure disorders [10]. Lindane 1% shampoo is banned in California due to environmental problems with lindane in sewage effluent [8].

a. Application of Shampoo: [3,10]

- Do not prescribe for pregnant women or children < 2 years old
- Apply to dry hair: 1 oz for short, 1 1/2 oz for medium, 2 oz for long hair
- Work thoroughly into hair and allow to remain in place for 4 minutes
- Add small amount of water until good lather forms, rinse hair thoroughly
- Towel briskly
- Comb with a fine toothed comb to remove dead lice and eggs
- Repeat application in 7 days to destroy lice hatched from nits not previously removed or affected by treatment

3. Combination Therapy with Permethrin and

Trimethoprim/Sulfamethoxazole (TMP/SMX, *Bactrim*):

TMP/SMX kills the bacteria within the nymph and adult forms of the head louse, which digests human blood [17] In cases of multiple treatment failures or suspected cases of lice-related resistance to therapy, treatment with 1% permethrin and oral TMP/SMX is recommended [11]. Dual therapy is not the first treatment of choice, it is essential to assess whether initial treatment failure is related to motivational non-compliance, misunderstood directions or resistant lice [11]. There are potential side effects from TMP/SMX and children should be monitored for allergic or toxic reactions. Also, treating a louse infestation with TMP/SMX may accelerate the emergence or spread of bacterial resistance, thereby diminishing the usefulness of these antibiotics [1]. Contraindicated with sulfa allergy.

● Instructions for dual therapy [11] include:

- Permethrin 1% cream rinse (*NIX*) use as above and repeat in 1 week plus
- TPM/SMX 10mg/kg/day based on TMP for 10 days BID; or
- TMP/SMX 1 tablet BID or 1 double strength tablet BID depending on weight

4. Malathion 0.5% (*Ovide Lotion*, prescription only):

Malathion has a very slow chemical reaction time. Unlike agricultural grade malathion with "toxic" impurities, the pharmaceutical grade malathion used in *Ovide* has a high level of purity, is safe and effective [9]. Withdrawn from the US market in 1995 because of commercial failure, due to its odor, long application time (8 to 12 hours) and flammability of its alcohol base, it was re-approved by the FDA in April

1999 as a pediculicide for head lice. [8,12] *Ovide* contains dipentene, terpineol, and 78% isopropanol to increase the pediculicidal and ovacidal activity of the malathion [8] Category B in pregnancy, caution with breast-feeding mothers, not studied in children under 2 years old. Malathion kills both lice and head lice eggs [8]

- Instructions for Lotion: [10]
 - Sprinkle on dry hair; rub gently until scalp is thoroughly moistened. Pay special attention to back of head & neck.
 - Allow to dry naturally, use no heat, leave uncovered
 - After 8 – 12 hours wash hair in non-medicated shampoo
 - Rinse and use a fine toothed comb to remove dead lice & eggs
 - Repeat application 7 days later if live lice detected. Repeat application rarely needed.

VI. NONPHARMACOLOGIC THERAPY:

A. Mechanical Removal

The use of a mechanical nit comb daily for two weeks is often recommended. Shampoo the hair with an olive oil or coconut oil based shampoo; scrub then rinse thoroughly. Repeat shampooing but do not rinse. Wrap a towel around the head for approximately 15-20 minutes after which you will begin mechanical removal. Bar soap with a coconut or olive oil base, or pure coconut or olive oil can also be used [7].

Separate hair into small sections and comb each strand with a fine-tooth comb angled at 45 degrees. The curved side of the teeth should be toward the head. There are several types of combing tools on the market without prescription, including the *LiceMeister* and the *Magi Comb*. [13] Repeat. Continue this regimen weekly while lice are still present in your environment, i.e., at home, at school. If reinfestation occurs, combing will have to be repeated more frequently [7].

B. Wet combing (Bug-busting) [13]

Soak hair with a 50/50 concentration of white vinegar and water for approximately 30-60 minutes prior to mechanical removal. The acidic environment reportedly assists with ungluing the nits [14].

C. Manual Removal

Separate hair into small sections and remove the nits (eggs) manually by hand. Nits should also be removed by hand if they are still present after combing [15].

D. Coating Agents (Vaseline/ Petroleum jelly, Mayonnaise)

This method reportedly inhibits louse mobility, causes inability for louse to feed and interferes with their respiratory efforts causing asphyxiation. A heavy layer of the agent is applied to the scalp and covered overnight with a shower cap. Vaseline is often avoided because of the difficulty washing it out; however, the use of Dawn dishwashing liquid as a crème rinse has reportedly helped [7]. Caution should be taken when using a plastic shower cap on children due to the risk of suffocation from the plastic.

E. Cut hair

Shaving the head is an approach that, while effective, is more readily accepted for male children but is not socially acceptable for the female population. Cutting the hair may make it easier for mechanical and manual removal of nits.

VII. FOLLOW-UP:

Follow-up in one to two weeks after treatment is recommended to assure adequate treatment [3].

VIII. REFERRAL:

Not necessary.

IX. LEVELS OF EVIDENCE:

Grading of resources

The evidence used for this guideline was one meta-analysis of randomized controlled trials (Dodd). There are five randomized controlled trials (Bingham, Hipolito, Meinking, Mumcuoglu and Roberts). Two articles were obtained from well-designed non-experimental descriptive studies (De Maeseneer and Juranek). All other evidence was obtained from expert committee reports or opinions and/or clinical experience of respected authorities.

Categories:

- Ia Evidence obtained from meta-analysis of randomized controlled trials
- Ib Evidence obtained from at least one randomized controlled trial
- IIa Evidence obtained from at least one well designed controlled study Without randomization
- IIb Evidence obtained from at least one other type of well designed quasi-experimental study
- III Evidence obtained from well-designed non-experimental descriptive studies such as comparative studies, correlation studies, and case control studies.
- IV Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities

X. GRADING OF RESOURCES:

Bingham

Ib

CDC fact sheet (two fact sheets) IV

De Maeseneer III

DiLoreto IV

Dodd Ia

Hipolito-2 articles, same study Ib

Headlice come back to school, too IV

Juranek III

Madureira IV

Meinking (two articles/same study) Ib

Mumcuoglu Ib

New York Coalition IV

Pollack	IV
Roberts (two articles/same study)	Ib
School systems	IV
Stewart	IV
Uphold	IV
Venna	IV

XI. Appendix A

The algorithm for "Recommendations for the Treatment of Pediculosis Capitis (Head Lice) in Children" is available on request from the guideline developer.

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